THE DYNAMIC EFFECTS OF ELIMINATING OR CURTAILING THE HOME MORTGAGE INTEREST DEDUCTION

PRESENTED IN SECTION: PUBLIC FINANCE APPLICATIONS OF DYNAMIC MODEL

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I. Introduction

The home mortgage interest deduction (MID) is one of the largest individual income tax expenditures. It is also an extremely popular and politically sensitive provision. Various tax reform plans proposed at the beginning of the decade included measures that would reform, severely curtail, or even eliminate the MID. Although the more recent House Republican Tax Reform Plan (HRTP) issued in June 2016 and President Trump's just-released Tax Cuts and Jobs Act (Tax Cuts) preserve the MID, the HRTP states that tax reform should make the MID a more effective and efficient incentive for home ownership, whereas the Tax Cuts proposal limits the MID to the interest on loans up to $500,000 (down from the current $1 million) and nearly doubles the standard deduction, which would dramatically reduce the number of itemizers who can take advantage of the MID. As one of the largest individual tax expenditures, it is important to evaluate the effectiveness of MID and weigh it against the need to reduce the deficit and the national debt, as should be done with all spending.

Although the current individual income tax system and recent reform proposals all recognize the importance of homeownership, the current deduction is not well-designed to achieve the stated goal of increasing homeownership. The current MID has been criticized for offering no subsidy to low- and middle-income individuals who do not itemize, whereas high income taxpayers reap significant benefits, which likely encourage the overconsumption of housing for high income taxpayers. Both the HRTP and the Tax Cuts proposal increase the standard deduction and preserve the MID, which strengtens the arguments against the deduction as it makes it less likely to achieve its intended objective.

Therefore, it is important to understand the dynamic effects of revising the MID under the current income tax. We draw our policy proposals from several earlier reform plans that have suggested reforms of the MID. For example, the report of the National Commission on Fiscal Responsibility and Reform (2010, the Simpson-Bowles report) recommends that the MID be replaced with a 12 percent nonrefundable tax credit for interest paid on mortgages on a principal residence, with the amount of the mortgage for which the credit is available capped at $500,000. Another proposal is

to eliminate MIDs for second or vacation homes (those that are not rental properties) and home equity loans.[1] Finally, some more sweeping reform proposals, such as the "zero plan" in the Simpson-Bowles report, would eliminate all income tax expenditures including the MID.

The paper proceeds as follows. The next section provides some background information on the MID. Section III provides a brief overview of the model, including the characteristics of the initial equilibrium and the parameter values used in the simulations. Section IV presents and discusses the simulation results. Section V concludes.

II. Background Information on the MID

This section provides some background information on the MID, drawing on several recent analyses of the deduction, especially a comprehensive study of the MID by Poterba and Sinai (2011). Their study uses data from the 2004 Survey of Consumer Finances (SCF), supplemented by tax calculations using TAXSIM (Feenberg and Coutts, 1993); we update the Poterba-Sinai calculations using 2016 SCF data.

A. Tax Expenditure Associated with the Home Mortgage Interest Deduction

We begin with estimates of the "tax expenditure" associated with the MID, which approximates the revenue loss due to the MID, neglecting any behavioral effects.[2] The Joint Committee on Taxation (2017) estimates that the tax expenditure for the MID in fiscal year 2016 was $59.0 billion and projects that it will be $83.4 billion in fiscal year 2020. The analogous estimates by the Office of Management and Budget (2016) are similar at $62.4 billion in 2016 and $91.4 billion in fiscal year 2020.

B. Home Mortgage Interest Deductions by Age

Mortgage interest deductions first increase and then decline with age, as young families move from being renters to purchasing their first homes and older homeowners pay off their mortgages over

[1] Similarly, the report of the Debt Reduction Task Force of the Bipartisan Policy Center (2010) recommends that the MID be replaced with a 15 percent refundable tax credit for up to $25,000 of home mortgage interest expense on a principal residence (which equals the annual interest paid on a $500,000 home mortgage loan with a 5 percent interest rate), and also recommends eliminating the MID for second or vacation homes.

[2] Tax expenditures are implicit government spending through the tax code that occurs due to deviations in the current income tax, such as special deductions or exemptions, from an idealized or "reference" tax code that approximates a comprehensive tax on economic income. For a recent collection of articles that analyze a wide variety of tax expenditures, see the June 2011 (Part 2) issue of the *National Tax Journal.*

time. This pattern is shown in Table II.1, as the fraction of mortgage interest deductions (MIDs) to adjusted gross income (AGI) increases until it reaches 5.7 percent for the 35 to under 45 age group, and then declines monotonically to 2.9 percent for those over the age 65.

Table II.1

Home Mortgage Interest Deductions by Age (2014, $billion)

Age	AGI	MID	MID/AGI (%)
All returns	6,385	287	4.5
Under 18	2	0	0.9
18 to under 26	34	1	3.1
26 to under 35	490	26	5.4
35 to under 45	1,249	71	5.7
45 to under 55	1,762	87	5.0
55 to under 65	1,606	65	4.0
65 and over	1,242	36	2.9

Source: IRS Statistics of Income, 2016, Table 2.6

C. Home Mortgage Interest Deductions by Income

Many discussions of the MID focus on its distribution across income classes. We provide several perspectives on the distributional implications of the MID. The first simply examines the variation of the deduction across income classes. Although the absolute value of the MID increases with income because higher income individuals own more expensive homes and are more likely to itemize deductions, IRS data show that the MID increases less than proportionately with AGI. Thus, Table II.2 shows that the ratio of MID to AGI declines monotonically from about 20 percent for households with AGI between $15,000–$20,000 (note that the figures below this level are misleading because the sample is very small, and the income data are likely to reflect significant under-reporting), to about 7 percent for households with AGI between $75,000–$100,000, to 1.2 percent for households with AGI between $1–1.5 million, and only 0.04 percent for households with AGI in excess of $10 million (with the current mortgage cap of $1 million limiting deductions for the higher income groups). Although, as will be discussed below, the value of the MID depends on the household's marginal tax rate and thus increases with income, the importance of the MID relative to AGI at lower and middle income levels (for tax filers who itemize) no doubt helps to explain its longstanding popularity and the difficulties previous reform efforts have encountered in trying to limit the deduction.

Table II.2
Home Mortgage Interest Deduction by AGI (2014)

AGI Class ($thousand)	Total AGI ($billion)	Total MID ($billion)	MID/AGI (%)
All returns	*6,385.2*	*286.75*	*4.49*
<5	*0.8*	*1.15*	*145.75*
5-10	*3.1*	*1.57*	*50.95*
10-15	*7.7*	*2.18*	*28.29*
15-20	*14.6*	*2.91*	*19.98*
20-25	*21.1*	*3.08*	*14.61*
25-30	*31.8*	*4.09*	*12.84*
30-35	*41.1*	*4.99*	*12.14*
35-40	*51.7*	*5.55*	*10.74*
40-45	*65.4*	*6.47*	*9.90*
45-50	*72.8*	*6.71*	*9.22*
50-55	*81.3*	*7.27*	*8.94*
55-60	*92.3*	*7.85*	*8.51*
60-75	*298.8*	*23.64*	*7.91*
75-100	*626.1*	*43.37*	*6.93*
100-200	*1,852.3*	*102.42*	*5.53*
200-500	*1,327.6*	*47.88*	*3.61*
500-1,000	*518.1*	*10.44*	*2.02*
1,000-1,500	*196.3*	*2.29*	*1.17*
1,500-2,000	*119.0*	*0.99*	*0.83*
2,000-5,000	*297.0*	*1.38*	*0.47*
5,000-10,000	*171.9*	*0.32*	*0.19*
>10,000	*494.6*	*0.19*	*0.04*

Source: IRS Statistics of Income, 2016, Table 2.1

As noted above, these data in part simply reflect the fact that higher income households tend to own more expensive homes. For example, Poterba and Sinai (2011) report average home values for all homeowners by income, as well as by age. In order to classify households according to a more comprehensive measure of income than AGI used for tax purposes, they use a broader measure of income defined as AGI plus income from non-taxable investments, employer contributions to social security, unemployment insurance and workers compensation, gross Social Security income, and some additional preference items under the alternative minimum tax. The resulting estimates of average home values by income and by age, updated to 2016 SCF data, are

shown in Table II.3. These data show that home value increases monotonically with income for each age group; for example, for households age 35–50, home value increases from $130,500 for households with annual income less than $40,000, to $378,100 for households with income between $125,000–$250,000, to $980,200 for households with annual income in excess of $250,000.[3]

Table II.3

Average Home Values by Income and Age (2015)

Age of Head of Household	Annual Household Income ($thousand)					
	<40	40–75	75–125	125–250	>250	All
25–35	137.0	173.8	191.8	305.7	730.9	*218.6*
35–50	130.5	162.4	237.5	378.1	980.2	*336.5*
50–65	153.0	195.0	238.0	419.4	981.4	*337.7*
> 65	143.3	202.6	260.4	410.1	885.8	*292.1*
All	*144.7*	*188.0*	*238.3*	*392.4*	*949.7*	*310.5*

Source: Authors' calculations, following methodology of Poterba and Sinai (2011), updated to 2016 SCF data.

The tendency for the MID to increase with income, however, is mitigated to some extent by the fact that loan-to-value ratios (LTVs) tend to decline at higher income levels; they are roughly constant or increase somewhat with income at lower income levels. This is demonstrated in Table II.4, which also follows Poterba and Sinai (2011), updated to 2016 SCF data. For example, for households of age 35–50, the LTV is roughly 61.0 percent for households with income between $75,000–$125,000, but falls to 50.4 percent for households with income in excess of $250,000. This table also shows that LTVs decline uniformly as households age and pay down their mortgages, as noted above.

[3] Carroll, O'Hare, and Swagel (2011) also provide details on home value by age (non-elderly and elderly), income, and marital status.

Table II.4

Loan-to-Value Ratios by Age and Income (Percent, 2015)

Age of Head of Household	Annual Household Income ($thousand)					
	<40	40–75	75–125	125–250	>250	*All*
25–35	50.2	59.1	70.9	67.5	59.4	*63.9*
35–50	42.7	54.1	61.0	57.1	50.4	*55.7*
50–65	27.6	34.8	35.6	39.6	25.0	*33.9*
> 65	16.5	19.0	17.3	16.5	15.0	*17.4*
All	*28.0*	*36.5*	*41.6*	*43.1*	*31.9*	*37.9*

Source: Authors' calculations, following methodology of Poterba and Sinai (2011), updated to 2016 SCF data.

For a deduction of any given size, the MID, like all deductions, is more valuable to higher income individuals because they face a higher marginal tax rate. Poterba and Sinai (2011) report average marginal tax rates applied to the MID by income as well as by age. The analogous estimates of the average marginal tax rate at which the MID is deducted, updated to 2016 SCF data, are shown in Table II.5. These figures show that for households of age less than 65 the MID is deducted at average marginal tax rates of less than 6 percent for households with broadly defined income less than $125,000, 9–15 percent for households with income between $125,000–$250,000, and 17–26 percent for households with income in excess of $250,000.

Table II.5

Average Marginal Tax Rate at which the MID is Deducted (2015)

Age of Head of Household	Annual Household Income ($thousand)					
	<40	40–75	75–125	125–250	>250	All
25–35	0.015	0.025	0.031	0.094	0.174	*0.044*
35–50	0.018	0.034	0.055	0.147	0.248	*0.097*
50–65	0.009	0.035	0.055	0.144	0.262	*0.087*
> 65	0.001	0.009	0.040	0.079	0.213	*0.042*
All	*0.008*	*0.024*	*0.048*	*0.125*	*0.243*	*0.071*

Source: Authors' calculations, following methodology of Poterba and Sinai (2011), updated to 2016 SCF data

Given all this information, Poterba and Sinai then calculate the distribution of the MID by examining the static effects of eliminating the deduction, that is, under the assumption of no

behavioral responses. Analogous results, updated to 2016 SCF data, are shown in Table II.6. These data show that the benefits of the MID are concentrated in the upper income classes, as the overall average tax savings is $561, but households with income between $75,000–$125,000 on average save $276, households with income between $125,000–$250,000 save $1,014, and households with income in excess of $250,000 save $2,372.

Table II.6

Distribution of Effects of Eliminating the MID (Average Dollar Tax Change, 2015)

Age of Head of Household	Annual Household Income					
	<40K	40–75K	75–125K	125–250K	250K+	*All*
25–35	48	150	185	665	1,467	*294*
35–50	196	218	371	1,477	3,885	*1,045*
50–65	19	160	371	1,128	2,138	*638*
> 65	14	32	130	298	881	*161*
All	*47*	*124*	*276*	*1,014*	*2,372*	*561*

Source: Authors' calculations, following methodology of Poterba and Sinai (2011), updated to 2016 SCF data

In the same vein, the JCT (2011) calculates the total value of the MID by income class, using a similarly broad definition of income, for taxpayers that benefit from the MID; these results, which are based on 2009 data, are replicated in Table II.7. These data indicate that in absolute terms the MID is highly concentrated among higher income groups. For example, 69.2 percent of the benefits of the MID go to households with broadly defined annual income in excess of $100,000, and 29.7 percent go to households with income in excess of $200,000.[4]

[4] Similarly, using data for 2010, Carroll, O'Hare, and Swagel (2011) estimate that 32.3 percent of the benefits of the MID go to households with income in excess of $200,000 and 69.1 percent go to households with income in excess of $100,000.

Table II.7

Distribution of Total Effects of Eliminating the MID (Total Tax Change, 2009)

Income Class ($thousand)	Amount ($billion)	Average ($)	Share (%)
under 10	0	--	0.0
10 to under 20	0.088	283	0.1
20 to under 30	0.521	521	0.7
30 to under 40	1.292	639	1.7
40 to under 50	2.329	797	3.0
50 to under 75	9.332	1,227	12.2
75 to under 100	10.066	1,490	13.1
100 to under 200	30.261	2,856	39.5
200 and over	22.768	6,650	29.7
Total	*76.656*	*2,213*	*100.0*

Source: JCT (2011), Table 3.

However, as suggested above, this result is expected, given that average house value—and the marginal tax rate at which deductions are taken and the likelihood of itemizing deductions—increases with income. As emphasized by Dietz and Siniaviskaia (2011), a natural question is whether the benefit of the MID increases more than proportionately with income; the data presented in Table II.2, which show that the value of the MID declines significantly as a fraction of AGI, suggest that this many not be the case. In addition, Dietz and Siniaviskaia use AGI as the income classifier rather than the broader measure of economic income used by Poterba and Sinai (2011) and JCT (2011), arguing that AGI is an intuitively more appealing—if less comprehensive—concept. The use of AGI implies that fewer taxpayers that claim the MID are in the highest (greater than $200,000) income category—2.4 million rather than 4.1 million when using economic income; similarly, only 7.8 million taxpayers are in the $100,000–$200,000 AGI category, while 13.6 million taxpayers are in the same range of economic income. Their results, which are based on 2004 data, are reproduced as Table II.8 below. In particular, using AGI as the income classifier, Dietz and Siniaviskaia show that 56 percent of the benefits of the MID go to households with annual income in excess of $100,000 (rather than 69.2 percent using the JCT

definition of economic income),[5] and 21 percent of these benefits go to households with income in excess of $200,000 (in comparison to the JCT estimate of 29.7 percent). More importantly, Dietz and Siniaviskaia show that the average benefit of the MID, relative to AGI, is roughly proportional, varying from 1.5 percent to 1.9 percent (neglecting the very small "under $10,000" income class, which has a 1.1 percent share), with the "over $200,000" AGI class having the lowest MID/AGI share of 1.5 percent. Thus, even though the benefits of the MID are highly concentrated in the upper income classes, income is as well, so that the benefits of the MID are roughly proportional to AGI —and indeed modestly progressive at the highest income level.

Table II.8

Distribution of Total Effects of Eliminating the MID (Total Tax Change, 2004)

Income Class ($thousand)	Amount ($billion)	Share (%)	MID Benefit/AGI (%)
under 10	0	0	1.1
10 to under 20	0.157	0	1.8
20 to under 30	0.833	1	1.7
30 to under 40	1.853	3	1.6
40 to under 50	3.204	6	1.9
50 to under 75	9.561	16	1.7
75 to under 100	10.098	17	1.7
100 to under 200	20.051	35	1.9
200 and over	12.239	21	1.5
Total	*57.997*	*100*	*1.7*

Source: Dietz and Siniaviskaia (2011), Table 4

D. Home Ownership by Income and Age

We also update the Poterba and Sinai analysis to 2016 SCF data to estimate the fraction of all households that are homeowners, by income and age, in 2015. These results are shown in Table II.9. For example, the fraction of homeowners in the 35–50 age group ranges from 25-86 percent, and increases monotonically with income.

[5] The Joint Committee on Taxation (JCT) estimated shares cited use 2009 data are not directly comparable to the shares using 2004 data calculated by Dietz and Siniaviskaia, but they are broadly similar; for example, the JCT estimate of the share of the top income class was 32 percent in 2004 and 30 percent in 2010.

Table II.9

Homeownership Rates by Income and by Age (%)

Age of House-hold Head	Annual Household Income					
	<40K	40–75K	75–125K	125–250K	250K+	*All*
25–35	14.7	34.2	58.6	75.0	74.5	*39.0*
35–50	24.9	49.2	70.3	84.4	86.3	*59.9*
50–65	42.0	68.1	84.7	90.5	90.9	*70.4*
> 65	54.6	76.9	85.5	87.0	82.3	*75.7*
All	*35.4*	*57.8*	*76.3*	*85.9*	*86.7*	*63.2*

Source: Authors' calculations, following methodology of Poterba and Sinai (2011), updated to 2016 SCF data

Finally, we use 2016 SCF data to estimate the value of residential real estate owned by households by income and age, which is shown in Table II.10.

Table II.10

Value of Residential Real Estate by Income and by Age ($billion, 2016)

Percentile of Income Distribution	Total Value ($billion)	Share (%)	Age	Total Value ($billion)	Share (%)
1-25	1,742	5.7%	< 35	1,945	6.4%
25-50	4,925	16.2%	35-44	4,030	13.2%
50-75	9,030	29.6%	45-54	6,517	21.4%
75-90	10,321	33.9%	55-64	8,094	26.6%
90-95	3,038	10.0%	≥65	9,891	32.5%
95-99	1,026	3.4%		30,477	100.0%
99-100	395	1.3%			
	30,477	100.0%			

Source: Authors' calculations, using 2016 SCF data

III. An Overview of the Model

A. The Structure of the Model

The basic features of the model used to analyze the effects of curtailing or limiting the MID in this report are as follows. The model is a dynamic, overlapping generations, CGE model of the U.S. economy that focuses on the macroeconomic, distributional, and transitional effects of tax reforms.

Consumers are assumed to make decisions regarding labor supply, consumption, and saving to maximize their welfare over a 55-year adult life, which consists of 45 working years followed by a 10-year retirement. Individual lifetime utility is a discounted sum of annual utilities, which are a function of a composite consumption good and leisure, and is characterized by constant intertemporal and intratemporal elasticities of substitution. There are thus 55 generations alive at any given point in time, and each generation includes 12 lifetime income groups, each characterized by its own lifetime earnings profile, government transfers profile, wealth holdings, consumption and saving patterns, etc. Individual consumers are assumed to have perfect foresight, that is, they can accurately predict the future effects of government policies on wages, consumer prices, interest rates, etc. There are four consumer goods in the model—a non-housing composite consumption good produced by the corporate sector (C), a non-housing composite consumption good produced by the non-corporate sector (N), owner-occupied housing (H), and rental housing (R). The model also includes relatively simple representations of bequests/inheritances (modeled as a target bequest), and tax-preferred retirement saving.

Business firms are assumed to maximize profits, and thus firm value, and to operate in perfectly competitive markets. Firm managers calculate the optimal time path of investment in response to changes in the tax structure, taking into account the costs of adjusting investment from its steady state level. Firm behavior is modeled separately for each of the four production sectors. Firms in the corporate sector are subject to a corporate income tax, and firms in the noncorporate sector and the rental housing sector (which is also treated as noncorporate) are taxed on a pass-through basis. Production functions in the non-housing good sectors are assumed to be Cobb-Douglas and production functions in the housing sectors are assumed to be characterized by a constant elasticity of substitution.[6] In the owner-occupied housing sector, an untaxed private firm combines capital and labor to produce housing and then rents housing services to homeowners. As in the other production sectors, an optimal time path of investment in housing is calculated, taking into account convex costs of adjusting the housing capital stock. The benefits of the MID are incorporated into the model as reductions in the prices of housing services, and these prices differ across income groups due to differences in the marginal tax rates at which the MID is taken, as shown in Table II.5. The debt-capital ratio is assumed to be fixed in each industry except in the owner-occupied

[6] This elasticity of substitution in housing production is assumed to be fairly low (0.25) on the assumption that the possibilities for substitution between the housing capital-land structure and labor are quite limited.

housing industry, where the debt-capital (loan-to-value) ratio changes at the time of enactment of the reform to reflect the reform-induced portfolio adjustment described in more detail below, and then remains constant. The version of the model used for this report assumes a closed economy.[7]

The government must finance in each period an exogenously specified time path of public services, which are assumed to be separable from the individual lifetime utility function, as well as government transfers, which are included in individual income. In the initial equilibrium, the tax instruments available to the federal government include a corporate income tax and a personal income tax with a progressive wage income tax structure (modeled as different constant marginal tax rates applied to the labor income of each of the 12 income groups), and a single constant rate capital income tax rate. In addition, the model includes a simple representation of the Social Security program.

After the enactment of any reform, the model must eventually arrive at a steady state equilibrium, in which all key macroeconomic variables, including GDP and output in the various sectors, the capital stock, the effective labor force, etc., grow at the steady state growth rate, which is defined as the sum of the long run population growth rate and the rate of labor-augmenting technological progress, both of which are specified exogenously and assumed to remain constant.

The model also calculates reform-induced changes in asset values in all four markets explicitly for each period after the enactment of a reform, taking into account both the effects of all changes in the tax treatment of existing capital assets, as well as their previous tax treatment under the existing tax system. The model is thus especially well-suited to analyzing the transitional effects of reform on the prices of housing and other assets, as well as the associated redistributions across all generations alive at the time of reform. The model also calculates the long-run economic effects of reform, including the effects of reform on future generations.

[7] Another version of the model includes a constant elasticity of supply of international capital in response to changes in the rate of return to capture the effects of reform on international capital flows; however, the reforms analyzed in this paper would not be expected to have large effects on international capital flows, which are ignored in the analysis.

B. The Initial Equilibrium and Model Parameter Values

The initial equilibrium is a stylized representation of the U.S. economy in 2016. Note that the initial equilibrium must be completely consistent with a steady state general equilibrium in the context of all of the elements of the dynamic, overlapping generations structure of the model discussed above. Although numerous compromises must be made to satisfy this condition, the initial equilibrium nevertheless represents a reasonable approximation of the potential full-employment U.S. economy in 2016. The fluctuations of the levels of housing investment in recent years are particularly notable. The last decade has been characterized by a boom, a bust, and then a gradual recovery in the housing sector. For example, new private residential construction in single-family homes (including remodels and additions), which corresponds to the owner-occupied housing sector in our model, was $444 billion in 2007. By 2009, this figure had hit the lowest point within the last decade, reaching $219 billion. It climbed back between 2010 and 2016, reaching $406 billion in 2016, which was still 7.6 percent lower than the 2007 level. New single-family home construction fell from $305 billion in 2007 to $105 billion in 2009, then climbed back to $242 billion in 2016, which was still 20.5 percent lower than the 2007 level. Multi-family new construction, corresponds to our rental-housing sector, was $49 billion in 2007 but fell to $28 billion in 2009, and climbed back to reach a new high of $61 billion in 2016, 21 percent higher than its 2007 level.

The recovery in the housing market is shown by the fact that the excess supply of housing that existed in 2009 has dissipated and possibly reversed as some evidence suggests that the current housing market is characterized by excess demand. For example, data from the U.S. Census Bureau indicate that vacancy rates for owner-occupied housing averaged 1.6 percent over the 1980s and 1990s. By comparison, this vacancy rate averaged 2.7 percent over 2007–2009, and this ratio has been declining since 2010, reaching 1.8 percent in 2016. As of the second quarter of 2017, the vacancy rate further declined to 1.5.[8] The National Association of Realtors (NAR) estimates that a healthy housing market typically has about 6 months of supply, but the total housing inventory has been below 6-month inventory levels over the last five years.[9] As of August 2017,

[8] See U.S Bureau of the Census, "Housing Vacancies and Homeownership (CPS/HVS), Table 2, Quarterly Homeowner Vacancy Rates: 1956 to Present, https://www.census.gov/housing/hvs/data/histtabs.html.

[9] National Association of Realtors, May 2017 Economic and Housing Market Outlook, slide 12. https://www.nar.realtor/presentations/may-2017-economic-and-housing-market-outlook

the total housing inventory declined to 1.88 million, which represents 4.5 months of supply. This inventory level is 6.5 percent lower than one year ago.[10]

Returning to the calibration of our model, the initial equilibrium is characterized by GDP of roughly $18.6 trillion and total national tax revenues of roughly $3.0 trillion, of which $1.2 trillion is raised from the progressive tax on labor income, $0.9 trillion is raised from the payroll tax on labor income, and $0.9 trillion is raised from flat rate taxes on various forms of capital income. Aggregate consumption is about $14.5 trillion and aggregate investment is $2.6 trillion. Total labor compensation is roughly $12.5 trillion and total capital income is $3.1 trillion.

In the initial equilibrium, the total capital stock is $30.9 trillion, of which $11.6 trillion is owner-occupied housing and $2.0 trillion is rental housing. Investment in owner-occupied housing is $0.5 trillion and investment in rental housing is $0.09 trillion, and the value of housing services produced is $1.6 trillion in the owner-occupied housing sector and $0.03 trillion in the rental housing sector.

Note that because the model is an equilibrium model, it is impossible to model the potential excess demand of housing that is likely to put upward pressure on housing prices for at least several years to come. However, the current environment characterized by excess demand of housing should be considered in conjunction with the housing price declines that we simulate in response to changes in the MID. Therefore, there may be offsetting effects between the downward pressure on housing prices that we simulate from eliminating or curtailing the MID and the upward pressure due to the current excess demand of housing in the near term. This implies that their combined effect on housing prices would be smaller than implied by implementing the policy to eliminate or curtail the MID in an equilibrium environment in which real housing prices were expected to remain constant.

The parameter values used in the model, as well as some justification for the values chosen based on the existing literature, are specified in Table P1. Key parameters include the intertemporal elasticity of substitution (0.3), the intratemporal elasticity of substitution (0.8), and the adjustment cost parameter in the housing sector (0.15).

[10] See https://www.forbes.com/sites/samanthasharf/2017/09/20/u-s-existing-home-sales-fell-in-august-as-inventory-shortage-deepened/#368b06653020. This article cites data from NAR: https://www.nar.realtor/research-and-statistics.

IV. Simulation Results

We provide the results of our CGE model simulations in this section. In all cases, we assume that the revenue gains obtained from curtailing or eliminating the MID are offset by increases in government transfers that are treated as lump sum payments to consumers. This approach allows us to focus on isolating the effects of changes to the MID without having to analyze simultaneously the distortionary effects of offsetting changes in other taxes or the level of government deficits. We focus on the macroeconomic effects of changes in the MID, including changes in housing investment, in the mix of rental and owner-occupied housing, and in the prices of existing owner-occupied and rental housing. In all cases, we show the short-run (two and five years after enactment), the medium-run (10 and 20 years after enactment), and the long-run (100 years after enactment) effects of the reform analyzed.

A. The Effects of Eliminating the Home Mortgage Interest Deduction

We begin by simulating the effects of eliminating the MID. Although such a reform seems unlikely from a political perspective, it provides a useful benchmark. Moreover, complete elimination of the MID was recommended in the "zero plan" option proposed by the Simpson-Bowles commission.

The static changes in tax liability that would arise from eliminating the MID are shown in Table II.6. However, in our simulations, we take into account the fact that eliminating the MID would eliminate the tax advantage favoring borrowing in the form of a home mortgage. This would create incentives for portfolio adjustments that would have the effect of reducing home mortgage debt. Specifically, after elimination of the MID, households with mortgage debt and financial assets that generate taxable income would be borrowing at the before-tax interest rate (since such interest would not be deductible) but investing at the after-tax interest rate. They would thus face an incentive to pay down their home mortgages by drawing down their holdings of financial assets. This would imply that static estimates of the revenue gains from eliminating the MID would overstate the direct revenue gains obtained, and some indirect revenue losses might also be incurred due to a decline in taxable interest, dividends, and capital gains on financial assets.

Several studies have attempted to estimate the magnitude of this effect, with the estimates implying a 15–75 percent revenue offset due to portfolio adjustments. In the most recent analysis, Poterba

and Sinai (2011) note that many households with relatively large mortgages have only a limited capacity to repay their mortgages because they do not have much financial wealth, while other households with significant financial wealth typically do not have much mortgage debt. These factors limit the portfolio adjustments that might occur to reduce mortgage debt if the MID were eliminated or curtailed. Nevertheless, their estimated revenue effects from portfolio adjustment are significant. For their preferred estimate, their portfolio adjustment calculates the amount of deductible mortgage debt that could be replaced by drawing down all available "non-transaction" liquid financial assets (that is, liquid financial assets other than savings, money market, and brokerage call accounts). This results in a reduction in the "static" revenue gains from eliminating the MID of roughly 20 percent.[11] Updating these figures to 2016 SCF data yields a somewhat larger estimate of 25 percent. The distribution of the change in tax liability by income and age of eliminating the MID, taking into account the decline in the LTVs due to the portfolio adjustment described above, is shown in Table IV.1. The losses experienced by elderly households and households with incomes less than $125,000 are modest, but higher income non-elderly households experience losses that range from $620–$2,550.

Table IV.1

Distribution of Effects of Eliminating the MID, with Portfolio Adjustment

(Average Dollar Tax Change, 2015)

Age of House-hold Head	Annual Household Income					
	<40K	40–75K	75–125K	125–250K	250K+	*All*
25–35	47	137	178	623	1,389	*276*
35–50	194	198	358	1,311	2,553	*842*
50–65	17	154	307	929	811	*429*
> 65	10	31	81	230	453	*105*
All	*45*	*116*	*237*	*871*	*1,298*	*421*

Source: Authors' calculations, following methodology of Poterba and Sinai (2011), updated to 2016 SCF data

The elimination of the MID will also increase the user cost of housing capital, defined as the marginal cost of housing services, taking into account all of the features of a given tax system. We follow the methodology used by Poterba and Sinai (2011) to calculate the user cost of housing capital, updated to 2016 SCF data. The changes in the user cost of housing capital caused by

[11] These estimates are broadly similar to the 25 percent estimate of Gervais and Pandey (2008) and the 16 percent estimate of Gale, Gruber, and Stephens-Davidowitz (2007).

elimination of the MID, after portfolio adjustments (but not including the general equilibrium effects simulated in our model), are shown in Table IV.2. On average, the user cost of capital increases by 1.2 percent. These increases are concentrated in the non-elderly upper income groups, especially with incomes between $125,000 and $250,000, where the user cost increases range from 2.4 to 3.9 percent.

Table IV.2

Changes in User Cost of Capital of Eliminating the MID, with Portfolio Adjustment (%)

Age of House-hold Head	Annual Household Income					
	<40K	40–75K	75–125K	125–250K	250K+	*All*
25–35	0.56	0.69	0.76	2.35	1.44	*1.06*
35–50	1.34	1.24	1.26	3.94	4.11	*2.40*
50–65	0.08	0.83	1.34	2.63	0.75	*1.26*
> 65	0.01	0.10	0.40	0.54	0.42	*0.27*
All	*0.29*	*0.63*	*0.97*	*2.57*	*1.76*	*1.23*

Source: Authors' calculations, following methodology of Poterba and Sinai (2011), updated to 2016 SCF data

We then simulate the macroeconomic effects of eliminating the MID in the model. The results of the simulation are shown in Table IV.3. The elimination of the MID is projected to increase revenues by roughly $65 billion, not including any dynamic effects of such a policy. To examine the dynamic effects of this tax change in the model, we assume that the increase in revenue associated with the elimination of the MID is offset with an increase in government transfers, which are lump sum transfers in the model. Thus, as described above, the simulation focuses solely on examining the substitution effects of eliminating the MID, with its income effects roughly offset by the reduction in government transfers.

The overall effects of eliminating the MID, coupled with an increase in government transfers, are generally small and negative in the short run, reflecting the costs of adjusting the capital stock, and small and neutral in the long run, reflecting the efficiency gain from reducing the tax preference for owner-occupied housing. In particular, GDP decreases by 0.3 percent two years after reform, decreases by 0.2 percent after 10 years, and decreases by 0.1 percent in the long run (modeled as 100 years). Total investment decreases by 0.5 percent two years after reform and by roughly 0.3 percent in the long run, with declines in investment in the owner-occupied housing sector roughly offsetting the increases in investment in the non-housing and rental housing sectors. Investment in

the corporate and non-corporate sectors increases by 0.7 percent initially and 0.4 percent in the long run. Investment in the rental housing sector increases by 1.2 percent initially, by 1.7 percent after 10 years, and by 1.1 percent in the long run as households shift from owning their own homes to renting housing services. Elimination of the MID implies that investment in owner-occupied housing decreases initially by 5.4 percent after two years, by 2.8 percent after ten years, and by 1.9 percent in the long run.

The overall unchanged investment is accompanied by an increase in saving of 1.0 percent two years after reform, 1.1 percent after 10 years, and 0.21 percent in the long run. Initially, consumption declines modestly (by 0.33 percent after two years), and in the long run, consumption declines by 0.14 percent. Labor supply decreases by about 0.06 percent in every year after reform.

The changes in firm values reflect the relatively more favorable treatment of non-housing and rental housing investment after reform. The value of firms in the non-housing sectors increases by roughly 0.6 percent initially and 0.4 percent in the long run. The value of rental housing firms increases by 0.4 percent two years after reform, by 0.9 percent 10 years after reform, and by 1.1 percent in the long run. By comparison, owner-occupied home values initially decline by 3.5 percent after two years, and by 2.3 percent after 10 years and 1.9 percent in the long run.

Table IV.3

Simulation Results: Elimination of Mortgage Interest Deduction

	Years After Reform				
Variable (Changes in %)	2	5	10	20	100
GDP	-0.32	-0.24	-0.17	-0.13	-0.14
Output of sector C and N	-0.02	0.03	0.06	0.08	0.06
Output of sector R	0.03	0.21	0.52	0.91	0.11
Output of sector H	-0.32	-0.86	-1.35	-1.69	-1.88
Investment	-0.51	-0.27	-0.07	0.01	-0.03
Investment in sector C	0.69	0.62	0.55	0.48	0.39
Investment in sector N	0.66	0.60	0.55	0.48	0.39
Investment in sector R	1.23	1.63	1.74	1.44	1.13
Investment in sector H	-5.35	-3.98	-2.78	-2.04	-1.87
Consumption	-0.33	-0.25	-0.19	-0.14	-0.14
Personal Saving	1.03	1.48	1.14	0.55	0.21
Government transfers	6.66	6.68	6.69	6.69	6.67
Labor Supply	-0.06	-0.06	-0.06	-0.06	-0.05
Firm value in C	0.59	0.54	0.52	0.48	0.38
Firm value in N	0.62	0.54	0.51	0.46	0.37
Firm value in R	0.38	0.61	0.87	1.04	1.07
Owner house value in H	-3.46	-2.86	-2.26	-1.09	-1.87
Producer price of R	-0.83	-0.47	-0.30	-0.34	-0.38
Producer price of H	-3.03	-2.09	-1.26	-0.70	-0.45
Wages	0.03	0.08	0.11	0.13	0.11
Interest rate	0.08	0.08	0.08	0.08	0.08

B. The Effects of Converting the MID to a Capped 12 Percent Credit

The second reform we analyze follows the main approach recommended by the Simpson-Bowles commission, which converts the MID to a nonrefundable 12 percent tax credit and caps the MID at $25,000 per year (as an approximation to the effects of a loan cap of $500,000).[12] We estimate the effects of this proposal by income group and age within the Poterba-Sinai framework, updating

[12] The Bipartisan Policy Center proposal included similar provisions—a 15 percent refundable credit with a loan cap of $500,000.

to 2016 SCF data. For the portfolio adjustment, we simply assume that mortgage debt is replaced only for interest in excess of the $25,000 cap, with the remaining debt maintained to obtain the 12 percent credit; this results in a reduction in the average LTV of only 3 percent. Note that since the credit is not available in any case to households with loans above the cap, this portfolio adjustment has no effect on the estimated change in tax liabilities. The resulting distribution of the effects of a 12 percent credit with a $25,000 interest cap is shown in Table IV.4. These figures indicate that the average change in tax liability of moving to the credit/cap, with or without the portfolio adjustment, is only 26 percent of the average change in tax liability of completely eliminating the MID with the portfolio adjustment. However, the differences in the tax changes are more pronounced than in the case of elimination of the MID, as low income households benefit from the reform since they receive the tax credit whether or not they itemize, while the largest losses are suffered by non-elderly high income households, who on average experience losses ranging from $400–$2,300. For households with income over $250,000 and age between 35 and 50, the losses are actually somewhat higher than in the case of elimination of the mortgage interest deduction because they are mitigated only slightly by portfolio adjustments. (Without portfolio adjustments, Tables II.6 and IV.4 show that the losses associated with elimination of the MID are all significantly higher than those caused by the capped credit.)

Table IV.4

Distribution of Effects of Replacing MID with 12 percent Credit and
$25,000 Interest Cap, with or without Portfolio Adjustment (Average Dollar Tax Change, 2015)

Age of House-hold Head	Annual Household Income					
	<40K	40–75K	75–125K	125–250K	250K+	*All*
25–35	-31	-240	-433	-238	-14	*-276*
35–50	10	-164	-294	494	2,308	*283*
50–65	-61	-148	-69	425	1,308	*182*
> 65	-7	-31	-26	50	478	*24*
All	*-28*	*-121*	*-163*	*300*	*1,382*	*109*

Source: Authors' calculations, following methodology of Poterba and Sinai (2011), updated to 2016 SCF data

The effects on the housing user cost of capital of replacing the MID with a 12 percent credit and a $25,000 interest cap are shown in Table IV.5. The increases in the user costs of capital of changing the MID to a credit and capping it are in general smaller than in the case of complete elimination of the MID and are negative for the lower income groups—reflecting the benefit of converting an MID that is only available to itemizers and deductible at the household's tax rate to a flat rate credit

available to all taxpayers whose value does not depend on the household's tax rate. The increases in the user cost of housing capital are significant only for households in the 35-50 age group with incomes in excess of $250,000, where user costs increase by 4.1 percent.

Table IV.5

Changes in User Cost of Capital of Replacing MID with 12% Credit and $25,000 Interest Cap, with Portfolio Adjustment (%)

Age of House-hold Head	Annual Household Income <40K	40–75K	75–125K	125–250K	250K+	*All*
25–35	-2.86	-2.87	-3.41	-1.36	0.73	*-2.64*
35–50	-1.75	-2.54	-2.48	1.15	4.11	*-0.60*
50–65	-2.06	-1.61	-0.79	1.10	2.50	*-0.37*
> 65	-1.03	-1.11	-0.52	0.12	0.77	*-0.59*
All	*-1.72*	*-1.80*	*-1.50*	*0.66*	*2.54*	*-0.75*

Source: Authors' calculations, following methodology of Poterba and Sinai (2011), updated to 2016 SCF data.

We next simulate the dynamic effects of replacing the MID with a 12 percent nonrefundable credit and a $25,000 interest cap in the CGE model, using these data to distribute the effects of the reform by income class and age. The results of this simulation are shown in Table IV.6. Neglecting dynamic effects, this policy change increases revenues by roughly $17 billion. To focus on the dynamic substitution effects of this tax change in the model, we again assume that the increase in revenue associated with the reform is offset with an increase in lump sum government transfers.

The overall effects on output of replacing the MID with a 12 percent credit and a $25,000 interest cap are generally small. In particular, GDP decreases by 0.1 percent two years after reform, by 0.04 percent after 10 years, and by 0.04 percent in the long run. Total investment returns to the pre-reform level in the long run, with declines in investment in the owner-occupied housing sector offsetting increases in investment in the non-housing and rental housing sectors. These effects are naturally significantly smaller than those that occur with elimination of the MID, as investment in the corporate and non-corporate sectors increases by 0.2 percent initially and 0.1 percent in the long run. Investment in the rental housing sector increases by 0.3 percent initially and in the long run as households shift from owning housing to renting housing services. The decline in investment in the owner-occupied housing sector is initially 1.4 percent after two years, falls to 0.7 percent after ten years, and equals 0.5 percent in the long run.

The overall flat level in investment is accompanied by an increase in saving of 0.3 percent after 10 years, and 0.05 percent in the long run. Initially, consumption declines modestly (by -0.09 percent after two years), and is 0.04 percent below the level in the initial steady state in the long run. Labor supply decreases by roughly 0.02 percent in every year after reform.

The changes in firm values reflect the relatively favorable treatment of non-housing and rental housing investment under the new tax regime, as the value of firms in the corporate and non-corporate sectors increase by roughly 0.2 percent initially and by 0.1 percent in the long run, and by 0.1 percent initially and by 0.3 percent in the long run in the rental housing sector. By comparison, owner house values initially decline by 0.9 percent after two years, and by 0.6 percent after 10 years and by 0.5 percent in the long run.

Table IV.6 Simulation Results:

Replacing the MID with a 12 Percent Nonrefundable Credit and a $25,000 Interest Cap

	Years After Reform				
Variable (Changes in %)	2	5	10	20	100
GDP	-0.09	-0.06	-0.04	-0.03	-0.04
Output of sector C and N	0.00	0.00	0.02	0.02	0.02
Output of sector R	0.01	0.06	0.14	0.24	0.29
Output of sector H	-0.08	-0.23	-0.36	-0.45	-0.50
Investment	-0.13	-0.07	-0.02	0.00	0
Investment in sector C	0.18	0.16	0.15	0.13	0.10
Investment in sector N	0.17	0.16	0.15	0.13	0.10
Investment in sector R	0.32	0.42	0.45	0.38	0.30
Investment in sector H	-1.42	-1.06	-0.74	-0.55	-0.50
Consumption	-0.09	-0.07	-0.05	-0.04	-0.04
Personal Saving	0	0.43	0.30	0.15	0.05
Government transfers	1.76	1.76	1.77	1.77	1.77
Labor Supply	-0.02	-0.02	-0.02	-0.02	-0.01
Firm value in C	0.17	0.14	0.14	0.13	0.10
Firm value in N	0.18	0.14	0.13	0.12	0.10
Firm value in R	0.11	0.16	0.23	0.27	0.28
Owner house value in H	-0.89	-0.76	-0.6	-0.51	-0.50
Producer price of R	-0.22	-0.13	-0.08	-0.09	-0.10
Producer price of H	-0.81	-0.55	-0.33	-0.19	-0.12
Wages	0.01	0.02	0.03	0.04	0.03
Interest rate	0.08	0.08	0.08	0.08	0.08

C. *The Effects of Limiting the MID to Principal Residences*

Another reform suggested in both the Simpson-Bowles and the Bipartisan Policy Center plans is to limit the MID to principal residences, that is, to disallow deductions for second and vacation homes and for home equity loans. We estimate the effects of this proposal by income group and age within the Poterba-Sinai framework, updating to 2016 SCF data, and including results both without and with portfolio adjustment. The resulting distributions of the effects of limiting the MID to only principal residences are shown in Table IV.7 (without the portfolio adjustment) and in Table IV.8 (with the portfolio adjustment, which applies only to mortgage debt other than that associated with principal residences, and results in a reduction in the amount of deductible mortgage debt of only about 3 percent). Note that these calculations imply that the MID is disallowed not only for loans on traditional second or vacation homes, but also for loans on "transitional" homes, such as an unsold home that used to be a primary home before a move to a new primary residence, or a newly-built home during its construction period.[13]

These figures indicate that the average change in tax liability of limiting the MID to principal residences, without portfolio adjustment, is 13.7 percent of the change in tax liability of completely eliminating the MID; the analogous figure with portfolio adjustment is 12.1 percent. The portfolio adjustment reduces the change in tax liability of limiting the MID to only principal residences by 34 percent.[14] These reform-induced changes in tax liability are generally quite small, and indeed are negligible except for households with incomes in excess of $125,000, where they are still generally less than $500. The effects of this reform on the user costs of housing capital are also quite modest, and are not shown.

[13] For further discussion, see National Association of Home Builders, "Where are the Nation's Second Homes?" http://eyeonhousing.wordpress.com/2011/08/24/where-are-the-nations-second-homes/.

[14] Note that this result is conservative in that we do not consider reallocation of debt from second and vacation homes to principal residences in response to limiting the MID to principal residences only. Cole, Gee, and Turner (2011) estimate that such adjustments would be sufficient to imply that there would be no tax cost to limiting the MID to primary residences.

Table IV.7

Distribution of Effects of Limiting the MID to Principal Residences without Portfolio Adjustment (Average Dollar Tax Change, 2015)

Age of House-hold Head	Annual Household Income					
	<40K	40–75K	75–125K	125–250K	250K+	*All*
25–35	0	0	4	49	0	*11*
35–50	7	2	19	146	444	*99*
50–65	4	23	31	211	624	*132*
> 65	11	1	3	34	185	*22*
All	*7*	*7*	*16*	*134*	*442*	*77*

Source: Authors' calculations, following methodology of Poterba and Sinai (2011), updated to 2016 SCF data

Table IV.8

Distribution of Effects of Limiting the MID to Principal Residences with Portfolio Adjustment (Average Dollar Tax Change, 2015)

Age of House-hold Head	Annual Household Income					
	<40K	40–75K	75–125K	125–250K	250K+	*All*
25–35	0	0	3	23	0	*6*
35–50	6	0	19	133	373	*87*
50–65	3	20	18	167	225	*74*
> 65	8	1	2	29	78	*13*
All	*5*	*6*	*11*	*111*	*229*	*51*

Source: Authors' calculations, following methodology of Poterba and Sinai (2011), updated to 2016 SCF data

We simulate the effects of limiting the MID to only principal residences in the model using these data to distribute the effects of the reform by income class and age. Neglecting dynamic effects, this policy change increases revenues by roughly $8.9 billion. The results of the simulation are shown in Table IV.9, and indicate that the overall effects of limiting the MID to only principal residences, assuming the additional revenues are used to fund an increase in government transfers, are generally quite small. For example, GDP decreases by only 0.04 percent two years after reform, and by 0.02 percent after 10 years, and decreases by 0.02 percent in the long run. Total investment returns to roughly the steady state level in the long run, with increases in investment in the non-housing and rental sectors roughly offsetting declines in investment in the owner-occupied housing sector. Investment in the corporate and non-corporate sectors increases by 0.09 percent initially

and by 0.05 percent in the long run. Investment in the rental housing sector increases by 0.17 percent initially and 0.14 percent in the long run. The decline in investment in the owner-occupied housing sector is 0.65 percent two years after reform, and 0.23 percent in the long run.

Personal saving decreases by 0.09 percent two years after reform and increases by 0.03 percent in the long run. Initially, consumption declines modestly (by less than 0.1 percent after two years), and by 0.02 percent in the long run. Labor supply decreases by 0.07 percent. The value of firms in the corporate and non-corporate sectors increases by roughly 0.1 percent in every year after reform. By comparison, owner house values decline by roughly 0.4 percent initially and 0.2 percent in the long run.

Table IV.9 Simulation Results:

Limiting the MID to Principal Residences

	Years After Reform				
Variable (Changes in %)	2	5	10	20	100
GDP	-0.04	-0.03	-0.02	-0.02	-0.02
Output of sector C and N	0	0	0.01	0.01	0.01
Output of sector R	0	0.03	0.06	0.11	0.14
Output of sector H	-0.03	-0.11	-0.17	-0.21	-0.24
Investment	-0.05	-0.03	-0.01	0	-0.04
Investment in sector C	0.09	0.07	0.07	0.06	0.05
Investment in sector N	0.09	0.07	0.07	0.06	0.05
Investment in sector R	0.17	0.19	0.21	0.18	0.14
Investment in sector H	-0.65	-0.51	-0.35	-0.26	-0.23
Consumption	-0.04	-0.03	-0.02	-0.02	-0.02
Personal Saving	-0.09	0.19	0.14	0.07	0.03
Government transfers	0.84	0.84	0.84	0.84	0.84
Labor Supply	-0.08	-0.07	-0.07	-0.07	-0.07
Firm value in C	0.09	0.07	0.06	0.06	0.05
Firm value in N	0.09	0.07	0.06	0.06	0.05
Firm value in R	0.06	0.07	0.11	0.13	0.13
Owner house value in H	-0.40	-0.36	-0.28	-0.24	-0.23
Producer price of R	-0.01	-0.06	-0.04	-0.04	-0.05
Producer price of H	-0.38	-0.26	-0.16	-0.09	-0.06
Wages	0	0.01	0.01	0.02	0.01
Interest rate	0.08	0.08	0.08	0.08	0.08

V. Conclusion

Several tax reform plans that recommend eliminating or curtailing the mortgage interest deduction (MID) have been proposed in recent years, including most recently the Tax Cuts and Jobs Act of the Trump Administration. Many observers have argued that a redesign of the MID system to ensure its effectiveness in conjunction with the effort to reduce the deficit and the national debt is crucial.

In this paper, we use a dynamic, overlapping generations, computable general equilibrium model of the U.S economy to simulate both the short run and long run dynamic macroeconomic effects of such proposals, including their effects on the housing market, such as changes in housing prices, housing investment, and the mix of owner-occupied and rental housing, as well their effects in several other dimensions. Our primary results can be summarized as follows.

The most dramatic reform we analyze is complete elimination of the MID. In this case, GDP decreases slightly (by 0.3 percent) in the short run due to the adjustment costs incurred in reallocating the capital stock, and decreases even more slightly (by 0.1 percent) in the long run. Overall investment decreases by less than 1 percent in the short run and returns to roughly the pre-reform level in the long run, reflecting the expected reform-induced increases in investment in the non-housing sectors and the rental housing sectors that roughly offsets the a decrease in investment in the owner-occupied housing sector, which is about 5 percent initially and 1.8 percent in the long run. Asset values increase in the non-housing sectors by 0.4 percent and by 1 percent in the rental housing sector in the long run, coupled with a decline in the value of owner-occupied housing of roughly 2 percent.

The effects of the other two reforms analyzed—replacing the MID with a 12 percent non-refundable credit subject to a $25,000 interest cap and limiting the MID to primary residences—are qualitatively similar but significantly smaller. For example, for the capped credit, housing investment in the owner-occupied sector declines initially 1.4 percent initially and by 0.5 percent in the long run, and the value of owner-occupied housing declines by roughly 0.9 percent in the short run and 0.5 percent in the long run. By comparison, the effects of the far more modest reform of limiting the MID to principal residences are unsurprisingly quite small, with investment in

owner-occupied housing falling by 0.7 percent initially and by 0.2 percent in the long run, and the value of owner-occupied housing falling by only 0.2 percent.

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TABLE P1. KEY PARAMETER VALUES

Parameter	Description	Value	Sources/Comments
n	population growth rate	0.011	Average over the past 20 and 50 years, Economic Report of the President (2010), Table B31
g	labor productivity growth rate	0.023	Average over the past 20 and 50 years, Economic Report of the President (2010), Table B50
σ_U	intertemporal EOS	0.30	0.25 (AAKSW, FJDKK) < 0.35 < 0.50 (FR)
ρ	rate of time preference	0.01	FJDKK
σ_C	intratemporal EOS (LE and CH)	0.80	0.80 (AAKSW)
σ_H	EOS between CN and HR	0.33	Li, Liu, and Yao (2009)
σ_N	EOS between C and N	5.0	FR
σ_R	EOS between H and R	1.5	Chosen to allow
β	adjustment cost factor, nonhousing	0.05	0.01 (Hall, 2004) < 0.05 < 0.10 (AAKSW)
β_H	adjustment cost factor, housing	0.15	Roughly consistent with Li, Liu, and Yao (2009)

Notes: AAKSW = Altig, Auerbach, Kotlikoff, Smetters, and Walliser (2001); FR = Fullerton and Rogers (1993); FJKKK = Fehr, Jokisch, Dallweit, Kindermann, and Kotloikoff (forthcoming); LE = leisure; CH = composite consumption-housing good; CN = composite corporate-noncorporate consumption good; HR = composite owner-housing and rental housing services; H = owner housing; R = rental housing; C = perfectly competitive corporate good; N = noncorporate business sector